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# Characterization of membrane foulants at ambient temperature anaerobic membrane bioreactor treating low-strength industrial wastewater

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**KEYWORDS**

Anaerobic membrane bioreactor, wastewater, fouling

## ABSTRACT

The large volume of industrial low-strength wastewaters has a potential for biogas production through conventional anaerobic digestion (AD), limited though by the need of heating and concentrating of the wastewaters. The use of anaerobic membrane bioreactor (AnMBR) combining membrane filtration with anaerobic biological treatment at low temperature could not only reduce the operational cost of AD, but also alleviate environmental problems. However, at low temperature the AnMBR may suffer more fouling due to the increased extracellular polymeric substances production excreted by bacteria hampering the application of the process for the industrial wastewater treatment.

In order to solve or reduce the fouling problem it is necessary to have a good insight into the processes that take place both on and in the membrane pores during filtration. Therefore, the objective of this study is to contribute to a better understanding of organic and biofouling in AnMBR.

An AnMBR consisting of external PVDF membrane was operated at 25°C and fed with synthetic dairy wastewater. Intensity, morphology and composition of foulants were determined using Scanning Electron Microscopy coupled with X-ray Energy Dispersive Spectrometry (EDS), Fourier Transform Infrared Spectrometry (ATR-FTIR), Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES), Ion chromatography (IC), zeta potential, and adenosine triphosphate measurements.

Based on membrane autopsies, it can be concluded that prevailing fouling is mainly of biological and organic origin. SEM observations demonstrated presence of numerous bacteria incorporated with the fouling layer composed of mainly proteins, carbohydrates and lipids as revealed by ATR-FTIR measurements. Furthermore the amounts of ions found by EDS & ICP-OES analysis do not support scaling layer formation.